DOCUMENT RESUME

ED 101 728 IR 001 580

AUTHOR DeNike, Lee
TITLE An Exploratory Study of Cognitive Style as a Predictor of Learning from Simulation Games.
PUB DATE Apr 75
NOTE 19p., Paper presented at the Association for Educational Communications and Technology Annual Convention (Dallas, Texas, April 14-17, 1975)

EDRS PRICE MF-$0.76 HC-$1.58 PLUS POSTAGE
DESCRIPTORS Academic Achievement; *Achievement Gains; *Educational Games; Elementary Education; Elementary School Students; Grade 5; *Learning Characteristics; Methods Research; *Predictor Variables; *Simulation; Social Studies; Student Characteristics
IDENTIFIERS *Cognitive Styles; MACOS; Man A Course of Study

ABSTRACT

Educational cognitive style (ECS) is concerned with the types of behaviors, or elements, employed by an individual to derive meaning from an educational task. To determine if a student's ECS is related to learning from a simulation game, an exploratory study was conducted with a sample of 24 fifth grade students. The students were divided into two groups to play two simulation games from the social studies curriculum Man: A Course of Study. Group 1 played three rounds of the Bow and Arrow Hunting Game, followed by the Crossing Place Hunting Game. Group 2 played the games in reverse order. Knowledge gain was measured by identical pre- and post-tests. After the gaming, an ECS test battery was administered to all participants. ECS elements were classified as to their frequency within the high- or low-achieving student groups. Results indicated that those students likely to derive maximum cognitive knowledge from a simulation game were those who gather information by listening, prefer peer group interaction, and tend to reason on the basis of rules. Students who tend to receive the least benefit from games derive information from both reading and listening and prefer independent activities. (SL)

ED101728

An Exploratory Study of Cognitive Style As a Predictor of Learning From Simulation Games

by

Lee DeNike, Ph. D.

U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Chairman
Department of Instructional Media
Fitchburg State College
Fitchburg, Massachusetts.

IR001 580

There are few instructional strategies which have experienced the phenomenal teacher acceptance enjoyed by simulation gaming. Indicative of this is the rapidly increasing number of simulation games being marketed. The first edition of The Guide to Simulations/Games for Education and Training, published in December 1970, listed slightly over 400 items. The second edition, published three years later, describes over 600, an increase of 50 percent in the simulation games commercially available.

Previous Research

Accompanying this growth has been a developing concern with the effectiveness of this instructional strategy. Wentworth and Lewis,[1] and Livingston and Stoll[2] summarize more than fifty studies which investigated the impact of simulation games on learning. Many of these studies can be categorized under the following questions:

1. Donald R. Wentworth and Darrell R. Lewis, "A Review of Research on Instructional Games and Simulations in Social Studies Education," Social Education, XXXVII (May, 1973), 432-440.

2. Samuel A. Livingston and Clarice Stoll, "Research on Games," Simulation Games: an Introduction for the Social Studies Teacher (New York: Free Press, 1973), 31-38.

1. Do simulation games motivate students?

Supportive Studies

a. Boocock found that students who had participated in an election campaign simulation game read and talked more about local elections than did students who did not participate.[3]

b. Clark, using a simulation game of a national nominating convention, determined that students who experienced the simulation game participated in election campaigns in a greater percentage than did students who had not been exposed to the activity.[4]

Non-Supportive Studies

a. Livingston found no significant increase in interest in politics for students who played the simulation game Democracy.[5]

b. In another study, Livingston reported that after playing Ghetto there was a significant decline of student interest in the subject of poverty.[6]

3. Sarane S. Boocock, "Effects of Election Campaign Game in Four High School Classes," Research Program in the Effects of Games with Simulated Environments in Secondary Education. Report No. 1 (Baltimore: Department of Social Relations, John Hopkins University, 1963).

4. Wentworth Clark, "A Research Note on Simulation in the Social Sciences," Simulation and Games, I (June, 1970), 203-10.

5. Samuel A. Livingston, "Effects of a Legislative Simulation Game on the Political Attitudes of Junior High School Students," Simulation and Games, III (March, 1972), 41-51.

6. Samuel A. Livingston, Simulation Games and Attitude Change: Attitudes Toward the Poor. Report No. 63. (Baltimore: Center for Social Organization of Schools, Johns Hopkins University, 1970).

2. Do simulation games promote the learning of factual knowledge?

Supportive Studies

a. Baker compared two classes who studied a unit on pre-Civil War America. One class used a simulation game approach while the other was taught using "traditional" techniques. He ascertained that the simulation game group outperformed the "traditional" group by a substantial margin on content tests.[7]

b. Emery and Enger found that a computer simulation game used to teach introductory economics was significantly related to student achievement.[8]

Non-Supportive Studies

a. Garvey and Seiler compared students who played Inter-Nation Simulation with a control group who received "instruction similar in every respect to that received by the experimental group except that simulation periods were replaced by lectures and discussions." A test of factual and conceptual knowledge showed that the control group made larger gains than the experimental group.[9]

b. Wentworth found that the use of the simulation game Marketplace resulted in a significant retardation of student learning of economics.[10]

7. Eugene H. Baker, "A Pre-Civil War Simulation for Teaching American," Simulation Games in Learning, ed. Sarane S. Boocock and E.O. Schild (Beverly Hills, Calif.: Sage Publications, 1968), 135-142.

8. E. David Emery and Thomas P. Enger, "Computer Gaming and Learning in an Introductory Economics Course," Journal of Economic Education, III (Spring, 1972), 77-85.

9. Dale M. Garvey and William H. Seiler, A Study of Effectiveness of Different Methods of Teaching International Relations to High School Students. (Emporia, Kansas: Kansas State Teachers College, 1966).

10. Donald R. Wentworth, "The Effectiveness of a Learning Game for Teaching Introductory Economics in Selected Two-Year Colleges" (unpublished doctoral dissertation, University of Minnesota, 1972).

3. Do simulation games change attitudes?

Supportive Studies

a. A study conducted by DeKock using Krathwohl's taxonomy of attitude change and the simulation game Sunshine indicated that a significant change in racial attitudes was brought about by the activity.[11]

b. Vogel investigated political efficacy. He found that students participating in City Council displayed significantly more positive attitudes of political efficacy when compared to students who learned about city council work in a class using a "conventional" strategy of instruction.[12]

Non-Supportive Studies

a. Corbin undertook a study evaluating a simulation game concerning Southeast Asia and found it had little effect on the political, social, and economic attitude of students.[13]

b. The Garvey and Seiler study referred to previously also attempted to identify changes in attitudes toward international relations. No identifiable pattern could be discovered which distinguished the experimental group from the control group.[14]

11. Paul DeKock, "Simulations and Changes in Racial Attitudes," Social Education, XXXII (February, 1969), 181-83.

12. R.W.Vogel, "The Effect of a Simulation Game on the Attitudes of Political Efficacy of Sixth-Grade Students" (unpublished master's thesis, University of Alberta, 1970).

13. W.S. Corbin, "The Effects of a Simulation Game about S.E. Asia on Political, Economic and Social Attitudes of Ninth Grade Students" (unpublished doctoral dissertation, The University of Rochester, 1971).

14. Garvey and Seiler, "A Study of Different Methods of Teaching International Relations."

Problem

These investigations by no means exhaust the research that relates to the three questions posed. However, the investigations presented are representative of the studies that have addressed themselves to the impact of simulation gaming on learning. The evidence accumulating from the cited inquiries testifies to the conflicting, and thus inconclusive, nature of the findings as a whole. It is unclear whether this state is due to the nature of the research or to the shortcomings of the instructional strategy. Fletcher hypothesizes that it is due to the nature of the research and calls for studies which give attention to the problem of player characteristics contending that "very little is known about what distinguishes between the kind of people who learn well under one set of conditions rather than under another."[15] In a similar vain Edwards noted the lack of investigations relating simulation games to any of the numerous learner characteristics and suggested that future studies concentrate on determination of student "variables that mediate...learning" from this strategy.[16]

15. Jerry L. Fletcher, "The Effectiveness of Simulation Games as Learning Environments," Simulation and Games, II (December, 1971), 451.

16. Keith Edwards, The Effect of Ability, Achievement, and Number of Plays on Learning from a Simulation Game. Report No. 115. (Baltimore: Center for Social Organization of Schools, Johns Hopkins University, 1971), 1.

The study described below attempted to determine if one of these variables, educational cognitive style, is related to learning from simulation games. More specifically, the study investigated two questions:

1. Are certain educational cognitive style elements held in common by students who achieve with regard to cognitive learning when simulation games are employed as an instructional strategy?

2. Are certain educational cognitive style elements held in common by students who do not achieve with regard to cognitive learning when simulation games are employed as an instructional strategy?

Instruments

Educational cognitive style as developed and defined by Joseph E. Hill is concerned with the type of behaviors (called elements) employed by an individual to derive meaning when confronted with an educational task.[17] These behaviors are currently categorized into three sets: the manner in which one gathers information, the manner in which one interprets information, and the manner in which one reasons to a decision or conclusion.

Closer examination of the first set reveals that it deals, in part, with the symbolic orientation of an individual; that is, with whether one acquires information from reading words, reading numbers, listening to words, and/or listening to numbers.

17. Laurence Wasser, "The Educational Science of Cognitive Style: An Introduction," (unpublished paper, Bloomfield Hills, Michigan: Oakland Community College, 1971), 1-3.

It also taps the ability to gather information using any or all of the five senses. The last portion of set one focuses on the learned societal behaviors which enable one to gain information about the people and/or objects that are encountered. Examples of these behaviors include sensitivity to the feelings of others, interpreting staged effects, and understanding non-linguistic functions.

The second set attends to three methods through which the information gathered can be interpreted. Does an individual seek elucidation from (1) his peers, (2) his family and/or other authority figures, or (3) make his own decisions as to the import of the information? This set has implications for the type of instructional setting in which a student prefers to operate. If peer reaction is sought then a small group setting conducive to peer interaction would be appropriate. When an individual elects to test the veracity or utility of information using family members and/or other authority figures as counselors, a teacher directed instructional setting would be compatible with that element of one's educational cognitive style. Those students who opt to make their own decisions concerning the meaning of the information gathered would be more comfortable in an independent study setting.

Set three centers on five reasoning behaviors an individual might employ to reach a decision or conclusion related to the information gathered and interpreted through sets one and two. Four inductive modalities have been enumerated: reasoning through the application of rules, definitions, and/or classifications; reasoning through the identification of differences between the information under consideration and previously collected information; reasoning through the identification of similarities between the information under consideration and previously collected information; and reasoning using all three of the modalities noted above. The fifth modality inference is deductive reasoning.

The Bow and Arrow Hunting Game and the Crossing Place Hunting Game were selected to facilitate the identification of any relationship between educational cognitive style and learning from simulation gaming. These two were developed as part of the "Man: A Course of Study" elementary social studies curriculum designed by the Educational Development Center at Cambridge, Massachusetts and were chosen because of their systematic development and thorough evaluation.[18]

Sample

It should be noted that the design of the study did not involve the testing or research hypotheses. Rather, the study was of an exploratory nature and, as such, was designed to generate hypotheses through the investigation of the two questions raised. Because of the study's exploratory nature a small sample consisting of twenty-four fifth graders from a school supported by public funds was selected.

18. Jerry L. Fletcher, "The Effects of Two Elementary School Social Studies Games: An Experimental Field Study" (unpublished doctoral dissertation, Harvard University, 1969).

Procedures

The sample was randomly divided into two groups. Group I played the Bow and Arrow Hunting Game first and the Crossing Place Hunting Game second. Before play of each simulation game a pre-test was given on the cognitive knowledge dealt with in the respective exercise. These test items were drawn from instruments validated in Fletcher's study. Three rounds of play for each simulation game were conducted because research carried on by Edwards revealed that multiple play promoted learning.[19] At the conclusion of each round of play five minutes were allotted for students to discuss the results of the completed round, to plan strategy for the ensuing round, and to rotate roles. When the three rounds of play for the Bow and Arrow Hunting Game terminated a post-test identical to the pre-test was administered. The same procedure was followed for the Crossing Place Hunting Game.

Group II followed the same pattern with one exception; the sequence in which the simulation games were played was reversed. This was done to ascertain if cognitive learning was affected by the order of play; i.e., if participation in one simulation game influenced cognitive learning in the second.

On the three alternating school days following the simulation game activity portions of the Educational Cognitive Style Test Battery developed by Oakland Community College were administered. This alternating strategy was used to avoid student fatigue.

19. Keith Edwards, The Effect of Ability, Achievement, and Number of Plays on Learning from a Simulation Game, 10.

Data Analysis

For the purposes of this study the assessment of cognitive learning was measured in terms of achievement. To determine achievement, a gain score of post-test minus pre-test was used. This resulted in each student having two gain scores, one for the Bow and Arrow Hunting Game and one for the Crossing Place Hunting Game. These two gain scores were averaged with a mean gain score being established for each student. The twenty-four mean gain scores were ranked from highest to lowest.

Examination was made of the educational cognitive style elements (behaviors) identified for each student whose mean gain score fell within the top (achievement) or bottom (non-achievement) 25 percent of the sample. If any element was exhibited by 70 percent or more of the members of each respective group, it was classified as an element common to that group. This procedure was designed to disclose those elements frequently used by the achievers and by the non-achievers when involved in simulation games.

To determine if achievement was affected by having students participate in a simulation game after previous exposure to a similar simulation game, the means of Groups I and II were tested using the F statistic at the .05 level of significance.

Findings

The elements found to be common to 70 percent or more of the members of the achievement group are reported in table 1.

TABLE 1

ELEMENTS COMMON TO ACHIEVEMENT GROUP

Set I

T(AL) - acquires a great deal of information from listening to words

Q(A) - acquires a great deal of information from sounds other than words or numbers

Q(CEM) - acquires a great deal of information through sensitivity to the feelings of others (empathizes)

Set II

A - prefers to interpret information through peer interaction

I' - makes some of his own interpretations of information

Set III

M' - reasons to some degree through the application of rules, definitions, and/or classifications

The elements contained in Table 2 represent the educational cognitive style behaviors exhibited by 70 percent or more of the members of the non-achievement group.

TABLE 2

ELEMENTS COMMON TO NON-ACHIEVEMENT GROUP

Set I

T'(VL)- acquires some information from reading words

T'(VL) - acquires some information from listening to words

Q'(CEM) - acquires some information through sensitivity to the feelings of others (empathizes to a limited degree)

Q(CKH) - acquires a great deal of information through the performance of psychomotor skills according to recommended form

Set II

A' - interprets information to some degree through peer interaction

I - prefers to make own interpretation of information

Set III

no element was exhibited by 70 percent of the group

The results of the ANOVA test for the Bow and Arrow Hunting Game and for the Crossing Place Hunting Game showed that neither of the differences on the main effect for groups or the interaction reached the .05 level of significance. Such results indicate that, for this study, the sequence in which the simulation games were played did not influence achievement. However, for the Crossing Place Hunting Game a significant pre-post difference was found across groups

($F = 8.28$, $p < .01$, $df = 1,22$). This suggests that for both Group I and Group II more cognitive learning resulted from participation in the Crossing Place Hunting Game than from the Bow and Arrow Hunting Game. The sums of squares, degrees of freedom, mean squares, and F - ratio calculated are shown in Tables 3 and 4.

TABLE 3

TWO-WAY REPEATED MEASURES ANALYSIS OF VARIANCE
FOR ACHIEVEMENT ON THE BOW AND ARROW HUNTING GAME

Source of Variance	SS	df	MS	F-ratio
Group I - Group II	2.083	1	2.083	0.087
Pre - Post	0.083	1	0.083	0.014
Interaction	0.000	1	0.000	0.000
Within cells	128.917	22	5.860	

TABLE 4

TWO-WAY REPEATED MEASURES ANALYSIS OF VARIANCE
FOR ACHIEVEMENT ON THE CROSSING PLACE HUNTING GAME

Source of Variance	SS	df	MS	F-ratio
Group I - Group II	0.750	1	0.750	0.022
Pre - Post	90.750	1	90.750	8.276
Interaction	27.000	1	27.000	2.462
Within cells	241.250	22	10.966	

Conclusions

It should be emphasized that all of the conclusions resulting from this study are tentative. It is not the intent of exploratory investigations, such as this one, to offer final conclusions to the phenomena with which the research is concerned. Rather, it is their purpose to generate hypotheses which are then either substantiated or rejected in hypothesis - testing studies.

Question One

> Are certain educational cognitive style elements held in common by students who achieve with regard to cognitive learning when simulation games are employed as an instructional strategy?

The findings of the study related to this question led to the hypothesis predicting that students who derive maximum cognitive knowledge from simulation game activities are likely to be those who (1) gather a great deal of information from listening to others, (2) derive meaning from sounds other than words or numbers, (3) empathize, (4) prefer peer-group interaction, (5) can but do not prefer to operate in independent study settings, and (6) reason to some degree through the application of rules and/or definitions.

Considering the type of the learning environment created by simulation games it seems axiomatic that students utilizing the behaviors identified above would be disposed to derive maximum cognitive meaning from the experience. To expound on this point further, since simulation gaming is of a highly verbal nature it is likely that it would be most beneficial to those students acquiring a great deal of information from listening to people and acquiring insights from the tone of voice or conventionalized utterances used by these people. Because the assumption of roles is intrinsic to a great many simulation games, those students possessing the capacity to empathize are likely to develop a more definitive understanding of the character of the roles included in the exercise. Being an instructional strategy which utilizes a peer-group rather than an independent study setting, those students preferring to interpret information through peer interaction are likely to be accommodated best. Finally, inasmuch as simulation games are played according to rules, those students capable of reasoning to conclusions or decisions through the application of rules are likely to be better attuned to the operational framework of this activity.

Question Two

> Are certain educational cognitive style elements held in common by students who do not achieve with regard to cognitive learning when simulation games are employed as an instructional strategy?

The findings of the study related to this question led to the hypothesis predicting that students who derive the least cognitive knowledge from simulation game activities are likely to be those who (1) acquire some information from reading words, (2) acquire some information from listening to others, (3) empathize to a limited degree, (4) are predominately interested in activities that have a strong psychomotor orientation, (5) do not prefer peer-group interaction, and (6) enjoy operating in a setting conducive to self study and independent decision making.

Reflecting again on the type of learning environment created by simulation games, it seems apparent that students who derive limited information from listening to others, who do not empathize to any meaningful extent and who would opt to work by themselves rather than in peer-group arrangements are prone to secure the least cognitive knowledge from this activity.

Implications

Fletcher's contention that the inconclusive state of simulation game research is due, in part, to the failure of simulation game investigators to consider various learner characteristics appears to be valid. This study has provided evidence that students possessing specific educational cognitive style elements either achieve or fail to achieve when simulation games are employed as an instructional strategy. Such a finding may contribute to an explanation of why past investigations have found simulation games changing attitudes in some classrooms while failing to do so in others; why some students are motivated

and some are not; and why the acquisition of cognitive knowledge is greater in some studies than in others. If future research verifies the hypothesis generated by this study, then simulation game advocates will be compelled to acknowledge what has been revealed for many other instructional strategies; namely, that simulation games promote learning in a particular type of student rather than possessing inherent qualities which make them generalizable to all types of students.